Material Safety Data Sheet

CN-5

1. Product and company identification

<table>
<thead>
<tr>
<th>Product name</th>
<th>CN-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS Number</td>
<td>27247-96-7</td>
</tr>
<tr>
<td>Generic Chemical Name</td>
<td>2-Ethylhexyl nitrate</td>
</tr>
<tr>
<td>Material uses</td>
<td>Cetane improver for automotive diesel fuels</td>
</tr>
<tr>
<td>Revision date</td>
<td>1 June 2011</td>
</tr>
<tr>
<td>Supplier/Manufacturer</td>
<td>PetroActive, LLC</td>
</tr>
<tr>
<td></td>
<td>202 N. 18th Street</td>
</tr>
<tr>
<td></td>
<td>LaPorte, TX 77572</td>
</tr>
<tr>
<td></td>
<td>Tel: 713-540-1070</td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:ehs@petroactive.com">ehs@petroactive.com</a></td>
</tr>
<tr>
<td>In case of emergency</td>
<td>CHEMTREC, 1-800-424-9300 (US)</td>
</tr>
<tr>
<td>Product type</td>
<td>Liquid.</td>
</tr>
</tbody>
</table>

2. Hazards identification

| Color                  | Clear colorless to yellow. |
| Physical state         | Liquid. |
| Odor                   | Pungent. |
| Principal Hazards      | WARNING. |
|                       | • Explosive reaction may occur on heating or burning. |
|                       | • Combustible liquid. |
|                       | • May cause eye irritation. |
|                       | • May cause skin irritation. |
| Target Organs          | Central nervous system |

See toxicological information for complete health hazard information (section 11)

3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS number</th>
<th>%</th>
<th>Carcinogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Ethylhexyl nitrate</td>
<td>27247-96-7</td>
<td>90-100</td>
<td>N/E</td>
</tr>
</tbody>
</table>

(N/E) – none established

4. First aid measures

**Eye contact**

: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.

**Skin contact**

: Wash with soap and water. Removal contaminated clothing. If skin irritation occurs, get medical attention. Launder contaminated clothing before reuse.

**Inhalation**

: Remove exposed person to fresh air if adverse effects are observed. If breathing is labored, administer oxygen. If breathing has stopped, apply artificial respiration. Call a poison center or doctor if exposed or you feel unwell.

**Oral**

: Do NOT induce vomiting. Immediately call a poison center or doctor. Aspiration of material due to vomiting can cause chemical pneumonitis which can be fatal. If vomiting occurs naturally, the casualty should lean forward to reduce the risk of aspiration.

**Additional Information**

: Note to physician: Treat symptomatically.
5. Fire-fighting measures

**Flash Point**: >65 °C, 149 °F PMCC (Minimum)

**Extinguishing Media**: CO2, dry chemical, or foam. Water can be used to cool and protect exposed material.

**Firefighting Procedures**
- Recommend wearing self-contained breathing apparatus. Water may cause splattering.

**Unusual Fire & Explosion Hazards**: Material may explode under confinement and high temperature. Vapors are heavier than air and may travel along the ground to a distant ignition source and flash back. Container may rupture on heating. Toxic nitrogen oxides may evolve when burning. The alkyl nitrate contained in this product may undergo a self-accelerating exothermic reaction if heated above 212 °F (100 °C). See section 10 for additional information.

6. Accidental release measures

**Spill Procedures**: Evacuate all non-essential personnel. Personal Protective Equipment must be worn, see Personal Protection Section for PPE recommendations. Take precautions to avoid release to the environment. Eliminate all ignition sources if safe to do so. Ventilate spill area. Prevent entry into sewers and waterways, dispose of in accordance with all federal, state and local environmental regulation. Pick up free liquid for recycle and/or disposal. Residual liquid can be absorbed on inert material. Check under Transportation and Labeling (DOT/CERCLA) and Other Regulatory Information Section (SARA) for hazardous substances to determine regulatory reporting requirements for spills.

7. Handling and storage

**Pumping Temperature**: Ambient

**Maximum Handling Temperature**: 45 °C, 113 °F

**Handling Procedures**: Keep away from potential sources of ignition. Keep containers closed when not in use. Do not discharge into drains or the environment, dispose to an authorized waste collection point. Use appropriate containment to avoid environmental contamination. DO NOT HEAT. Wash thoroughly after handling. Launder contaminated clothing before reuse. Empty containers retain material residue. Do not cut, weld, braze, solder, drill, grind or expose containers to heat, flame, spark or other sources of ignition. Dispose of packaging or containers in accordance with local, regional, national and international regulations.

**Maximum Handling Temperature**: Ambient

**Handling Procedures**: Do not store near potential sources of ignition. Take precautions to avoid release to the environment. Store in a well-ventilated place. Keep cool. Store locked up. Store in accordance with local, regional, national and international regulations. See section 10 for incompatible materials.

**Pumping Temperature**: Not determined.

8. Exposure Controls/Personal Protection

**Exposure Limits**

<table>
<thead>
<tr>
<th>Exposure Limits</th>
<th>OSHA</th>
<th>ACGIH</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-Ethylhexyl nitrate</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>(s) – Skin exposure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(p) – Proposed limit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) – Ceiling exposure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(I) – Recommended exposure limit</td>
<td>1 ppm (l)</td>
<td></td>
<td>N/E</td>
</tr>
<tr>
<td>(u) – Supplier recommended exposure limit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N/E) – None established</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other Exposure Limits**: The recommended TWA for 2-ethylhexyl nitrate is 1 PPM.

**Engineering Controls**: Use material in well ventilated area only. Additional ventilation or exhaust may be required to maintain air concentrations below recommended exposure limits.

**Gloves Procedures**: Nitrile.

**Eye Protection**: Safety glasses. If potential for splash or mist exists, wear chemical goggles or faceshield.
**Respiratory Protection**
Use NIOSH/MSHA approved respirator with a combination organic vapor and high efficiency filter cartridge if recommended exposure limit is exceeded. Use self-contained breathing apparatus for entry into confined space, for other poorly ventilated areas and for large spill clean-up sites.

**Clothing Recommendation**
Long sleeve shirt is recommended. Wear either a chemical protective suit or apron when potential for contact with material exists. Do not wear rings, watches or similar apparel that could entrap the material and cause a skin reaction. Launder contaminated clothing before reuse.

### 9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flash point</strong></td>
<td>&gt;65 °C, 149 °F PMCC (Minimum)</td>
</tr>
<tr>
<td><strong>Auto-ignition temperature</strong></td>
<td>130 °C, 266 °F</td>
</tr>
<tr>
<td><strong>Upper Flammable Limit</strong></td>
<td>7%</td>
</tr>
<tr>
<td><strong>Lower Flammable Limit</strong></td>
<td>0.3%</td>
</tr>
<tr>
<td><strong>Explosion Data</strong></td>
<td>Heating material under confinement may cause an explosion.</td>
</tr>
<tr>
<td><strong>Appearance</strong></td>
<td>clear colorless to yellow liquid</td>
</tr>
<tr>
<td><strong>Bulk Density</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Odor</strong></td>
<td>Pungent</td>
</tr>
<tr>
<td><strong>Odor Threshold</strong></td>
<td>&gt;100 °C, 212 °F (Typical)</td>
</tr>
<tr>
<td><strong>Boiling point</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Melting/freezing point</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Specific gravity</strong></td>
<td>0.97 (15.6°C)</td>
</tr>
<tr>
<td><strong>Vapor pressure</strong></td>
<td>0.2 mmHg (20°C)</td>
</tr>
<tr>
<td><strong>Vapor density</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Evaporation rate</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>VOC</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Percent Volatile</strong></td>
<td>100%</td>
</tr>
<tr>
<td><strong>Viscosity</strong></td>
<td>1.8 Centistokes (20°C), 1.2 Centistokes (40°C)</td>
</tr>
<tr>
<td><strong>Water solubility</strong></td>
<td>Insoluble</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Percent Solid</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Pour Point Temperature</strong></td>
<td>=&gt;-40 °C, -40 °F</td>
</tr>
</tbody>
</table>

*The above data are typical values and do not constitute a specification. Vapor pressure data are calculated unless otherwise noted.*

### 10. Stability and reactivity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stability</strong></td>
<td>Heating material under confinement may cause an explosion.</td>
</tr>
<tr>
<td><strong>Decomposition Temperature</strong></td>
<td>&gt;100 °C, &gt;212 °F</td>
</tr>
<tr>
<td><strong>Incompatibility</strong></td>
<td>Strong oxidizing agents, Nitriles</td>
</tr>
<tr>
<td><strong>Polymerization</strong></td>
<td>Will not occur.</td>
</tr>
<tr>
<td><strong>Thermal Decomposition</strong></td>
<td>Smoke, carbon monoxide, carbon dioxide, aldehydes and other products of incomplete combustion. Under combustion conditions, oxides of the following elements will be formed: nitrogen.</td>
</tr>
</tbody>
</table>

**Conditions to Avoid**
Not determined.
### 11. Toxicological information

#### - ACUTE EXPOSURE -

**Eye Irritation**
- May cause eye irritation. Does not meet Canadian D2B or EU R36 criteria. Based on data from similar materials.

**Skin Irritation**
- May cause mild skin irritation. Does not meet Canadian D2B or EU R38 criteria. Based on data from similar materials.

**Respiratory Irritation**
- No data available to indicate product or components may cause respiratory irritation under normal workplace conditions and good industrial hygiene practices.

**Dermal Toxicity**
- The LD50 in rabbits is >2000 mg/Kg. Based on data from components or similar materials. Overexposure to organic nitrates by skin contact may cause headache, nausea and decreased blood pressure.

**Inhalation Toxicity**
- The LC50 (1 hr.) in rats for dust or mist of this material is 20 – 200 mg/l. Based on data from components or similar materials. Overexposure to organic nitrates by inhalation may cause headache, nausea and decreased blood pressure.

**Oral Toxicity**
- The LD50 in rates is >5000 mg/Kg. Based on data from components or similar materials. Ingestion can cause cyanosis, collapse and coma.

**Inhalation Sensitization**
- No data available to indicate product or components may be respiratory sensitizers.

**Dermal Sensitization**
- Not expected to cause skin sensitization. Based on data from similar materials.

#### - CHRONIC EXPOSURE –

**Chronic Toxicity**
- No data available to indicate product or components present at greater than 1% are chronic health hazards.

**Carcinogenicity**
- No data available to indicate product or components present at greater than 0.1% may present a carcinogenic hazard.

**Mutagenicity**
- No data available to indicate product or components present at greater than 0.1% are mutagenic or genotoxic.

**Reproductive Toxicity**
- No data available to indicate product or components present at greater than 0.1% that may cause reproductive toxicity.

**Teratogenicity**
- No data available to indicate product or components present at greater than 0.1% may cause birth defects.

#### - ADDITIONAL INFORMATION –

**Other**
- No other health hazards known.

### 12. Ecological information

#### - ENVIRONMENTAL TOXICITY –

**Freshwater Fish Toxicity**
- The acute LC50 is 100 – 1000 mg/L based on actual data.

**Freshwater Invertebrates Toxicity**
- The acute EC50 is 1 – 10 mg/L based on actual data.

**Algal Inhibition**
- Not determined.

**Saltwater Fish Toxicity**
- The acute LC50 is 100 – 1000 mg/L based on similar materials.

**Saltwater Invertebrates Toxicity**
- Not determined.

**Bacteria Toxicity**
- The acute LC50 is 10 – 100 ppm based on similar materials.

**Miscellaneous Toxicity**
- Not determined.

#### - ENVIRONMENTAL FATE –

**Biodegradation**
- This product shows limited biodegradation based on actual OECD 301-type test data.

**Bioaccumulation**
- This material potentially bioconcentrates, based on QSAR calculated octanol/water coefficient data.

**Soil Mobility**
- Not determined.
13. Disposal considerations

Waste disposal: This material, if discarded, is not a hazardous waste under RCRA Regulation 40 CFR 261. Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations.

14. Transport information

ICAO/IATA I: Not regulated.
ICAO/IATA II: UN3082 Environmentally hazardous substance, liquid, n.o.s. (Alkyl C7-C9 nitrates), 9, III, Marine Pollutant (Alkyl C7-C9 nitrates)
IMDG: UN3082 Environmentally hazardous substance, liquid, n.o.s. (Alkyl C7-C9 nitrates), 9, III, Marine Pollutant (Alkyl C7-C9 nitrates)
IMDG EMS Fire: F-A
IMDG EMS Spill: S-F
IMDG MFAG: None
MARPOL Annex II: Not determined.
USCG Compatibility: Not determined.
U.S. DOT Bulk: NA1993 Combustible liquid, n.o.s. (2-Ethylhexyl nitrate), III, Marine Pollutant (Alkyl C7-C9 nitrates)
DOT NAERG: 128
U.S. DOT Non-Bulk: Not regulated.
U.S. DOT Non-Bulk NAERG: Not applicable.
Canada: UN3082 Environmentally hazardous substance, liquid, n.o.s. (Alkyl C7-C9 nitrates), 9, III, Marine Pollutant (Alkyl C7-C9 nitrates)
Mexico: UN3082 Environmentally hazardous substance, liquid, n.o.s. (Alkyl C7-C9 nitrates), 9, III, Marine Pollutant (Alkyl C7-C9 nitrates)

Bulk Quantity: 85000 KG, 187391 lbs.
Intermediate Quantity: 11000 KG, 24251 lbs.
Non-Bulk Quantity: 400 KG, 882 lbs.

Review classification requirements before shipping materials at elevated temperatures.

15. Regulatory information

-Global Chemical Inventories-
USA: All components of this material are on the US TSCA Inventory or are exempt.
Other TSCA Reg.: None known
EU: All components are in compliance with the EC Seventh amendment Directive 92/32/EEC.
Japan: All components are in compliance with the Chemical Substances Control Law of Japan.
Australia: All components are in compliance with chemical notification requirements in New Zealand.
Canada: All components are in compliance with the Canadian Environmental Protection Act and are present on the Domestic Substances List.
Switzerland: All components are in compliance with the Environmentally Hazardous Substances Ordinance in Switzerland.
Korea: All components in compliance in Korea.
Philippines: All components are in compliance with the Philippines Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (R.A. 6969)
China: All components of this product are listed on the Inventory of Existing Chemical Substances in China.
Taiwan: All components of this product are listed on the Taiwan inventory.

-Other US Federal Regulations-
SARA Ext. Haz. Subst.: This product does not contain greater than 1.0% of any chemical substance on the SARA Extremely Hazardous Substances list.
SARA Section 313: This product does not contain greater than 1.0% (greater than 0.1% for carcinogenic substance) of any chemical substances listed under SARA Section 313.
SARA 313 Classifications: Acute Hazard YES
: Chronic Hazard YES
: Fire Hazard YES
: Reactivity Hazard YES
CERCLA Hazardous Substances: None known.
-State Regulations-

Cal. Prop. 65: This product does not intentionally contain any chemicals known by the State of California to cause cancer and/or birth defects. Moreover, we do not routinely analyze its products for impurities which may be such chemicals.

-Product Registrations-

U.S. Fuel Registration: This fuel additive is registered in the United States.
Finnish Registration Number: Not registered.
Swedish Registration Number: Not registered.
Norwegian Registration Number: 23609
Danish Registration Number: Not registered.
Swiss Registration Number: 617300
Italian Registration Number: Not registered.

-Other / International-

Miscellaneous Regulatory Information: Not determined.

16. Other information

Precautionary Labels: Warning.
- Explosive reaction may occur on heating or burning.
- Combustible liquid.
- May cause eye irritation.
- May cause skin irritation.

HMIS Codes: Health : 1* Fire : 2 Reactivity : 3
US NFPA Codes: Health : 1 Fire : 2 Reactivity : 3 Special : N/E
Date of issue: 06/01/2011
Version: 1

Notice to reader
To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.